US EPA Region 10
1200 6th Ave Suite 900
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Seattle, WA 98101

REVISED FACT SHEET

**The United States Environmental Protection Agency (EPA)
Plans To Reissue A National Pollutant Discharge Elimination System (NPDES) Permit to the following facility:**

Warm Spring Forest Products Industries
and
Warm Springs Biomass Project, LLC
Warm Springs, Oregon 97761
and
the Confederated Tribes of the Warm Springs Reservation of Oregon

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EPA Proposes To Reissue NPDES Permit

EPA proposes to reissue an NPDES permit to the facility referenced above. The draft permit places conditions on the discharge of pollutants from the facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations, and other conditions for the facility
- a map and description of the discharge locations
- technical material supporting the conditions in each permit

401 Certification for Facilities that Discharge to Tribal Waters

EPA is requesting the CTWSRO certify the NPDES permit for the Warm springs Biomass LLC (formerly the Warm Springs Forest Products Industries (WSFPI)) facility, under section 401 of the Clean Water Act.

Public Comment

Persons wishing to comment on, or request a Public Hearing for the draft permit for this facility may do so in writing by the expiration date of the Public Comment period. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearings must be in writing and should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the Public Notice expires, and all comments have been considered, EPA's Regional Director for the Office of Water will make a final decision regarding permit reissuance. If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 30 days after the issuance date, unless an appeal is submitted to the Environmental Appeals Board within 30 days.

Documents are Available for Review.

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (see address below). The draft permit, fact sheet, and other information can also be found by visiting the Region 10 website at "www.epa.gov/r10earth/water.htm."

United States Environmental Protection Agency
Oregon Operations Office
811 SW 6th Avenue, 3rd Floor
Portland, Oregon 97204
(503) 326-2653

The Fact Sheet and draft permit are also available at:

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Suite 900 M/S OWW-130
Seattle, Washington 98101
(206) 553-8414 or 1-800-424-4372 (within Region 10)

Tribal Administration Building
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1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
AML	Average Monthly Limit
BOD_5	Biochemical oxygen demand, five-day
BE	Biological evaluation
°C	Degrees Celsius
cfs	Cubic feet per second
CFR	Code of Federal Regulations
CV	Coefficient of Variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
I/I	Inflow and Infiltration
lbs/day	Pounds per day
LTA	Long Term Average
mg/L	Milligrams per liter
ml	milliliters
ML	Minimum Level
µg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit
MPN	Most Probable Number
N	Nitrogen
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OW	Office of Water
O&M	Operations and maintenance
POTW	Publicly owned treatment works
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
s.u.	Standard Units
TMDL	Total Maximum Daily Load
TRE	Toxicity Reduction Evaluation
TSD	Technical Support document (EPA, 1991)
TSS	Total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Services

UV	Ultraviolet radiation
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limit
WWTP	Wastewater treatment plant

I. APPLICANTS

Warm Springs Forest Products Industries and Warm Springs Biomass Project, LLC (WSFPI/WSB)
NPDES Permit No.: OR-002405-8

P.O. Box 810
Warm Springs, Oregon 97761

Contacts: Mark Jackson, WSFPI (541) 553-1131
Cal Mukumoto, WSB (541) 553-1131

II. FACILITY INFORMATION

In general, facility information is provided in the fact sheet dated August 24, 2007. Summary information on the facility is provided in this fact sheet, in Appendix A. However, since that fact sheet was drafted, EPA has obtained new information about the facility, as described below.

In an e-mail message dated October 15, 2007, Darrel Kelly, formerly of Warm Springs Forest Products, stated that the flow rate from Outfall 003, when a discharge occurs, would be about 300 gallons per minute (0.432 mgd), but that the discharge would last less than one hour, resulting in a total of less than 18,000 gallons per occurrence. The volume of the pond is 250,000 gallons. In the past, the log pond discharged excess water to Shitke Creek through Outfall 003 on a continuous basis. In 1986, the company filled in the majority of the old mill pond to create solid ground for the construction of the Small Log Sawmill. During that process, a headgate and culvert system that previously supplied water from Shitike Creek to the old mill pond was removed. The water supply for the old mill pond was then changed to the supply line from the Deschutes River Pumping Station. This is the same system and operational method that is currently in effect. The Shitike Creek Pumping Station was installed during this period and was piped to what remains of the old mill pond, but has always been used as an intermittent or backup system and is not run on a continuous basis.

On August 24, 2007, EPA issued a draft permit for this facility for public comment. During the public comment period, EPA determined that the Tribe's temperature criteria had not been properly applied in developing the draft permit. EPA has corrected the errors made in the original draft permit. At this time EPA will only accept comments on aspects of the draft permit that are different from those in the August 24, 2007 draft permit (effluent limits for heat for June through September, and the temperature effluent limit for May).

III. RECEIVING WATER

In general, the receiving water is described in the Fact Sheet dated August 24, 2007.

A. Water Quality Standards

Because the receiving waters are within the Warm Springs Reservation, the permit was written to meet the water quality standards set by the CTWSRO Tribal Council. The Tribe's water quality standards are at least as stringent as the State of Oregon's water quality standards for the Deschutes River and Shitike Creek. Therefore, effluent limits based on the Tribal water quality standards will also be protective of the State of Oregon's water quality standards in waters of the State of Oregon that are adjacent to or downstream of the Tribal waters.

An NPDES permit must ensure that the discharge from the facility complies with the Tribe's water quality standards. A Tribe's water quality standards are composed of use classifications, numeric and/or narrative water quality criteria, and an anti-degradation policy. The use classification system designates the beneficial uses (such as cold water biota, contact recreation, etc.) that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the Tribe to support the beneficial use classification of each water body. The anti-degradation policy represents a three tiered approach to maintain and protect various levels of water quality and uses.

Analysis of effluent monitoring data from the facility, the permit application, and computer modeling results that analyze the impact of the discharge on temperature in the Deschutes River indicate that the facility requires updated permit limits. Because the effluent limits in the draft permit are derived from and comply with water quality standards, the discharges as authorized in the draft permit will not result in degradation of the receiving water.

When EPA prepared the original draft permit, EPA misinterpreted the Tribe's water quality standards for temperature. Specifically, EPA did not apply the Tribe's water quality standards for protection of salmonid spawning and incubation year-round, as required by the water quality standards. The revised draft permit includes more stringent effluent limits for temperature, based on the corrected interpretation of the standards. The process for deriving the revised effluent limits is provided in Appendix B.

B. Water Quality Limited

Any waterbody for which the water quality does not, and/or is not expected to meet, applicable water quality standards is defined as a "water quality limited segment." None of the receiving waters for this permit are water quality limited.

For more information, see the fact sheet dated August 24, 2007.

IV. EFFLUENT LIMITATIONS

A. Basis for Permit Effluent Limits

In general, the CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards of a waterbody are being met and they may be more stringent than technology-based effluent limits. The bases for the proposed effluent limits in the draft permit are provided in Appendix B. The effluent limits in the draft permit are identical to the limits in the draft permit made available for public comment on August 24, 2007, except for the effluent limits for temperature and heat, for the season of May – September.

B. Proposed Effluent Limitations

The following summarizes the proposed effluent limitations that are in the draft permit.

1. There must be no discharge of floating, suspended or submerged matter such that it impairs designated beneficial uses.
2. There must be no discharge of oil and grease that could cause discoloration, scum, oily sleek or floating solids, or coating of aquatic life with oil films.
3. There must be no discharge of wastewater from cold deck log sprinkling, air scrubber, filter backwash or steam vat condensate which are retained in a non-overflowing pond or recycled.
4. There must be no discharge of biocides, domestic sewage, chromium compounds, copper, or zinc.
5. Discharges which will violate water quality standards adopted in the Warm Springs Tribal Code Chapter 432 outside the mixing zones, defined for Outfall 001 as 10 feet upstream to 400 feet downstream and 100 feet from shore and for Outfall 003 from the shore to midstream, downstream 100 feet, and upstream 5 feet, are not authorized by this permit.
6. There must be no discharge of process wastewater from the facility.

Tables 1 and 2, below, present the proposed effluent limits for Outfalls 001 and 003.

Table 1 Maximum Daily Effluent Limitations, Outfall 001	
Parameters	**Maximum Daily Limit**
Flow, mgd	17.5
Temperature, °C (Except May)	32
Temperature, °C (May)	23.6
Net Rate of Addition of Heat, million BTU/day (June - October)	673
pH, s.u.	6.5 – 8.5 at all times

Table 2 Effluent Limitations, Outfall 003	
Parameter	**Limit**
pH, s.u.	6.5 – 8.5 at all times

C. Basis for Less Stringent Effluent Limit for Flow

The basis for the less stringent effluent limit for flow (relative to the 1988 permit) is explained in the Fact Sheet dated August 24, 2007.

V. MONITORING REQUIREMENTS

A. Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality. The permittee is responsible for conducting the monitoring and for reporting results on Discharge Monitoring Reports (DMRs) to the U.S. Environmental Protection Agency (EPA).

B. Effluent and Surface Water Monitoring

The effluent and surface water monitoring requirements in the revised draft permit are identical to those in the draft permit made available for public comment on August 24, 2007, except for minor changes made to the language of the surface water monitoring requirements for clarity. See the fact sheet dated August 24, 2007, for an explanation of the effluent and surface water monitoring requirements.

VI. OTHER PERMIT CONDITIONS

A. Quality Assurance and Operation and Maintenance Plans

The quality assurance plan and operation and maintenance plan requirements in the revised draft permit are identical to those in the draft permit issued for public comment on August 24, 2007. See the fact sheet dated August 24, 2007 for an explanation of these requirements.

B. Penalties for Violations of Permit Conditions

Possible penalties for violations of permit conditions are listed in Part IV.B of the draft permit. See the fact sheet dated August 24, 2007 for an explanation of the penalties.

VIII. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

The Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species.

A revised Biological Evaluation (BE) analyzing the effects of the discharge from the treatment facility on listed endangered and threatened species in the vicinity of the facility was prepared. The revised BE incorporates the revised effluent limits and other new information obtained since the original draft permit was issued for public comment The revised BE is available upon request.

In the revised BE, EPA determined that reissuance of this permit may affect, but is not likely to adversely affect the listed fish species (bull trout and steelhead) in the vicinity of the discharge. EPA will seek concurrence from USFWS and NMFS on the not likely to adversely affect determination.

B. Essential Fish Habitat

Essential fish habitat (EFH) is the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires EPA to consult with the National Marine Fisheries Service (NMFS) when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. EFH was evaluated in the BE described above. EPA concludes that the issuance of this permit will not affect EFH for Chinook salmon and coho salmon.

C. Tribal Certification

Section 401 of the CWA requires EPA to seek Tribal certification before issuing a final permit. As a result of the certification, the Tribe may require more stringent permit conditions or additional monitoring requirements to ensure that the permit complies with water quality standards.

D. Permit Expiration

This permit will expire five years from the effective date of the permit.

Appendix A - Facility Information

Warm Springs Forest Products Industries and Warm Springs Biomass Project, LLC.	
NPDES ID Number:	OR-002405-8
Mailing Address:	P.O. Box 810 Warm Springs, Oregon 97661
Facility Background:	The facility's existing permit became effective January 14, 1988 and expired on January 13, 1993. The current permit application was received in February 2007.
Facility Information	
Treatment Train:	None. Outfall 001 consists of non-contact turbine and compressor cooling water. Outfall 003 consists of overflows from a raw water reservoir holding pond that is dosed with calcium hypochlorite to reduce algal growth..
Design Flow:	Outfall 001: 17.5 mgd Outfall 003: batch discharge
Existing Flow:	8.64 mgd (average daily flow rate) Outfall 003: batch discharge approximately once/year
Months when Discharge Occurs:	Outfall 001: continuous Outfall 003: batch discharge, approximately once/year
Outfall Location:	Outfall 001 latitude: 44° 46' 00" N, latitude: 121° 13' 30" W Outfall 003 latitude: 44° 46' 00" N, latitude: 121° 13' 30" W
Receiving Water Information	
Receiving Water:	Outfall 001: Deschutes River Outfall 003: Shitike Creek
Subbasin:	Lower Deschutes (HUC 17070306)
Beneficial Uses:	Deschutes River: Public water supply; industrial water supply; irrigation; livestock watering, anadramous fish passage; salmonid fish rearing and spawning; resident fish and aquatic life; wildlife and hunting; fishing; boating and rafting; water contact recreation; aesthetic quality; and cultural and religious practices. Shitike Creek: Industrial water supply; salmonid fish rearing and spawning; resident fish and aquatic life; wildlife and hunting; fishing; and water contact recreation.
Water Quality Limited Segment:	None
Low Flow:	**Deschutes River (7Q10 values):** October = 3,280 cfs November – March = 3,270 cfs April – September = 3,260 cfs **Shitike Creek:** 1Q10 is 27 cfs 7Q10 is 28 cfs

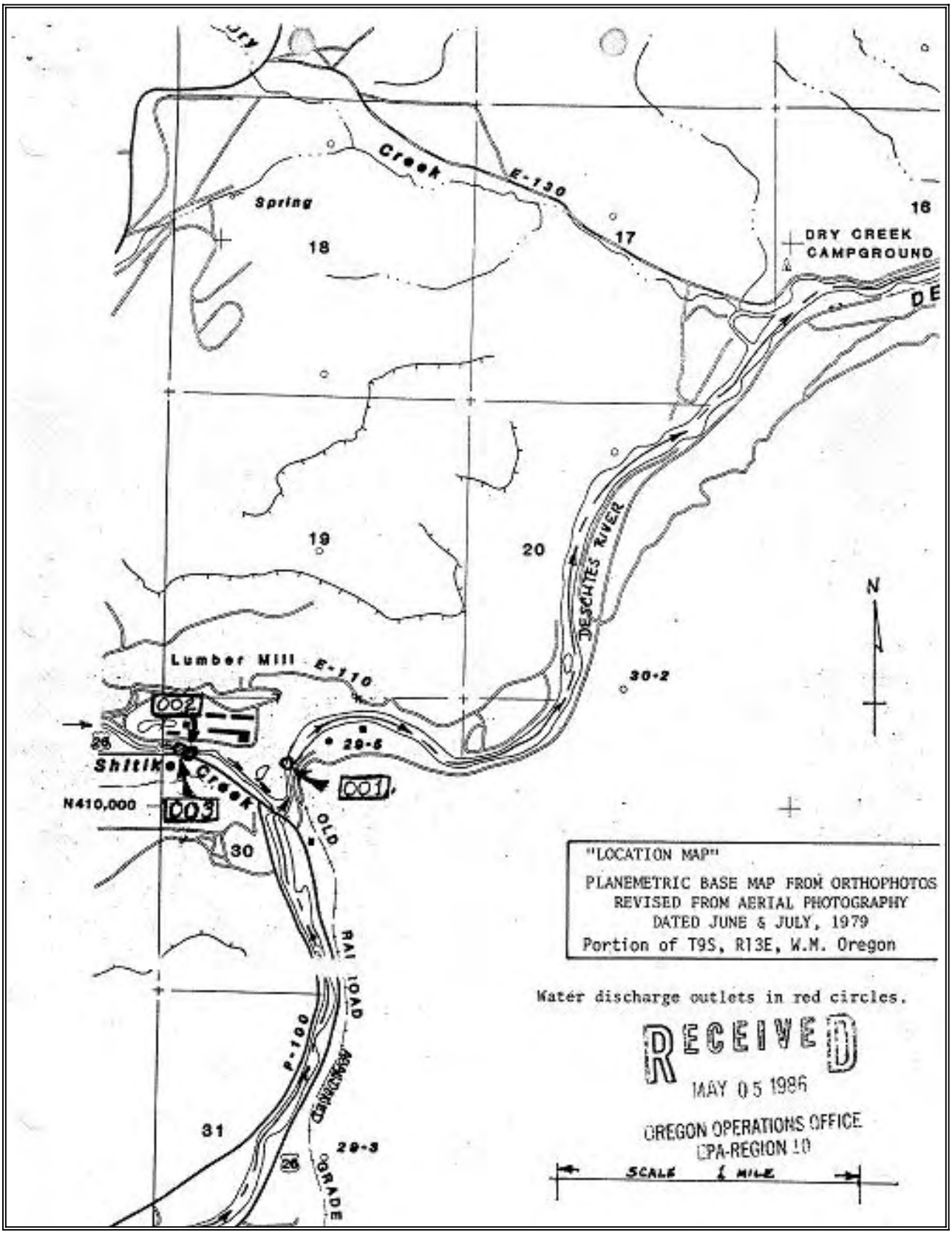

Figure A-1 Location Map (note that Outfall 002 has been eliminated).

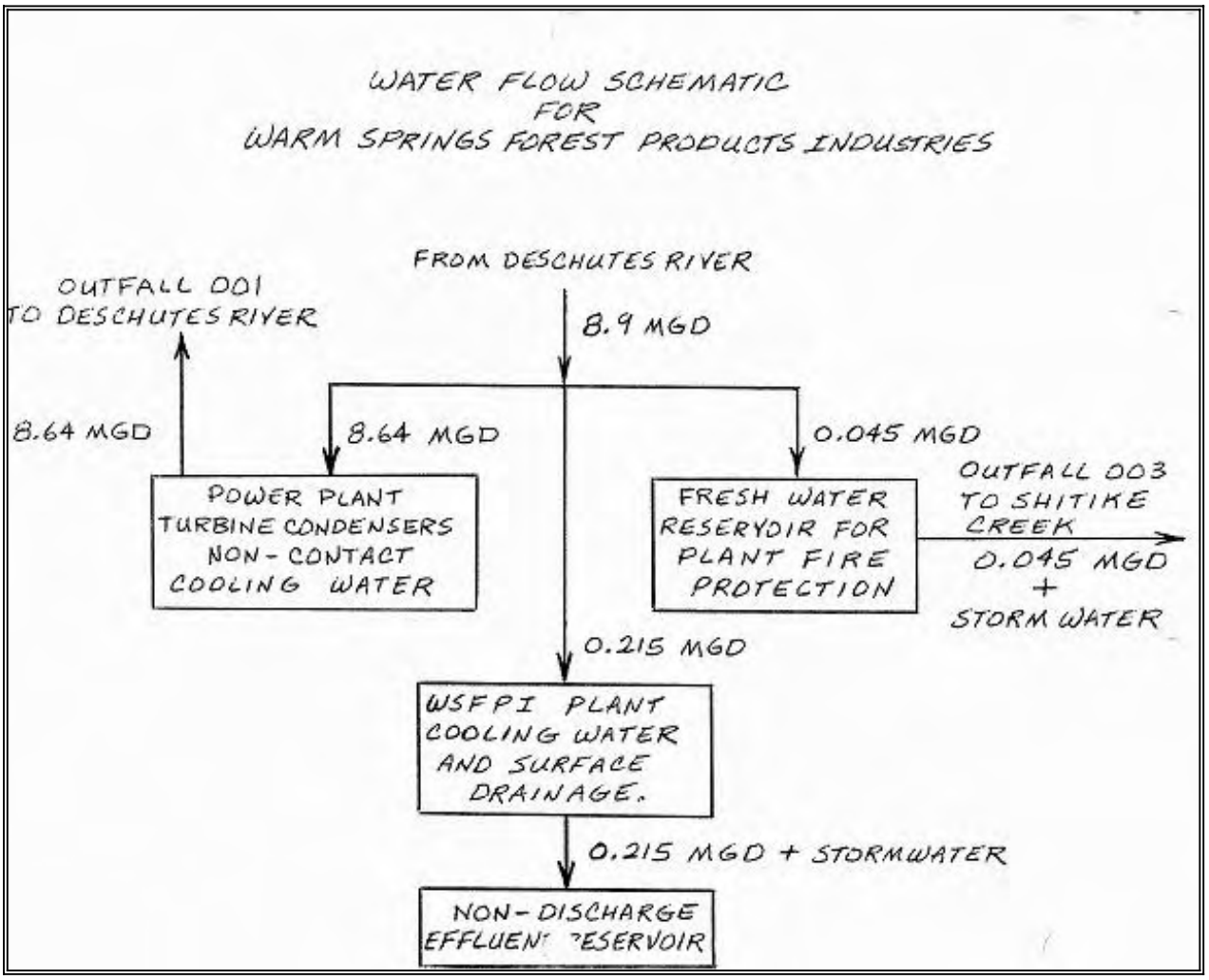

Figure A-2 Process Schematic
(Note: Cooling water effluent flow rate has increased to a maximum of 17.5 mgd, and outfall 003 no longer contains storm water.)

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Appendix B - Basis for Effluent Limitations

The following discussion explains in more detail the statutory and regulatory basis for the technology- and water quality-based effluent limits in the draft permit. Part A discusses technology based effluent limits and Part B discusses water quality based effluent limits.

A. Technology Based Effluent Limits

1. Limits Based on Effluent Guidelines

In 1981, EPA promulgated effluent limit guidelines for the timber products industry in 40 CFR Part 429. The effluent limit guidelines for sawmills and planning mills appear in 40 CFR Part 429, Subpart K. These effluent limit guidelines prohibit discharge of process wastewater to waters of the United States. Discharges of non-contact cooling water, material storage yard runoff, boiler blowdown, and fire control water are excluded from the definition of "process wastewater" in 40 CFR 429.11(c). Therefore, the effluent limit guidelines do not prohibit the discharge of such waters, or other discharges that are not "process wastewater" as defined in 40 CFR 122.2. Consistent with the effluent limit guidelines, the proposed permit prohibits discharges of process wastewater.

Previously, the facility was also subject to effluent limit guidelines promulgated for wet storage of logs, which appear in 40 CFR Part 429, Subpart I. These effluent limit guidelines require that the pH of wastewater from wet storage logs be no less than 6.0 and no greater than 9.0 standard units. The effluent limit guidelines also prohibit the discharge of debris, which is defined as "woody material, such as bark, twigs, branches, heartwood and sapwood that will not pass through a 1-inch diameter round opening and is present in the discharge from a wet storage facility."

These effluent limit guidelines were previously applicable to Outfall 003. However, the facility has indicated that Outfall 003 no longer functions as a wet storage area for logs, and so these guidelines no longer apply to Outfall 003 or any other outfall.

Draft Permit Limits:
Monitoring data for WSFPI/WSB from May 2002 through February 2006 was examined to determine if any considerations were necessary in updating effluent limits. The facility violated the temperature limit for effluent from Outfall 001 twice during the previous permit (July and October, 2004), although, in a 5 year period of effluent data, there were 12 months for which no data were reported. An analysis of 9,931 hourly effluent temperature data points collected between January 1, 2005 and December 22, 2006 shows a 95th percentile temperature of

27.2 ºC, a 99th percentile temperature of 29.4 ºC, and a maximum effluent temperature of 32.2 ºC. The facility had no violations of its pH limits for either Outfall 001 or Outfall 003 during the time period evaluated, although twelve records were missing for each pH evaluation.

Based on these evaluations, the WSFPI/WSB facility can meet the limits in the expired permit, although the flow rate will increase above the effluent limit in the expired permit. Compliance with the reporting requirements will be emphasized during the current permit cycle.

B. Water Quality-Based Effluent Limits

The following discussion is divided into four sections. Section 1 discusses the statutory basis for including water quality based effluent limits in NPDES permits, section 2 discusses the procedures used to determine if water quality based effluent limits are needed in an NPDES permit, section 3 discusses the procedures used to develop water quality based effluent limits, and section 4 discusses the specific water quality based limits.

1. Statutory Basis for Water Quality-Based Limits

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards. Discharges to Tribal waters must also comply with limitations imposed by the Tribe as part of its certification of NPDES permits under section 401 of the CWA.

The NPDES regulation (40 CFR 122.44(d)(1)) implementing section 301 (b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any Tribal water quality standard, including State/Tribal narrative criteria for water quality.

The regulations require that this evaluation be made using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

2. Reasonable Potential Analysis

When evaluating the effluent to determine if water quality-based effluent limits are needed based on chemical specific numeric criteria, a projection of the receiving water concentration (downstream of where the effluent enters the

receiving water) for each pollutant of concern is made. The chemical specific concentration of the effluent and receiving water and, if appropriate, the dilution available from the receiving water are factors used to project the receiving water concentration. If the projected concentration of the receiving water exceeds the numeric criterion for a specific chemical, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

Sometimes it is appropriate to allow a small area of receiving water to provide dilution of the effluent; these areas are called mixing zones. Mixing zone allowances will increase the mass loadings of the pollutant to the water body, and decrease treatment requirements. Mixing zones can be used only when there is adequate receiving water flow volume and the receiving water is below the chemical specific numeric criterion necessary to protect the designated uses of the water body. Mixing zones must be authorized by the CTWSRO.

3. Procedure for Deriving Water Quality-Based Effluent Limits

The first step in developing a water quality based permit limit is to develop a wasteload allocation (WLA) for the pollutant. A wasteload allocation is the concentration or loading of a pollutant that the permittee may discharge without causing or an exceedance of water quality standards in the receiving water.

In cases where a mixing zone is not authorized, either because the receiving water already exceeds the criterion, the receiving water flow is too low to provide dilution, or the State or Tribe does not authorize one, the criterion becomes the WLA. Establishing the criterion as the wasteload allocation ensures that the permittee will not contribute to an exceedance of the criterion.

4. Specific Water Quality-Based Effluent Limits

(a) Floating, Suspended or Submerged Matter

Section 432.100(4) of the Tribe's WQS requires surface waters on the reservation to be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses.

(b) Oil and Grease

Section 432.100(4) of the Tribe's WQS requires surface waters on the reservation to be free from oil or scum in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses.

(c) pH

Section 432.100(2)(d) of the Tribe's WQS requires that ambient pH be within the range of 6.5 – 8.5 standard units. This requirement is reflected in the draft permit.

(d) Temperature

WSFPI/WSB discharges non-contact turbine cooling water through Outfall 001 to the Deschutes River through a diffuser. The primary concern regarding once-through cooling systems is the development and dissipation of thermal plumes. The Deschutes River is designated under the Tribal Water Quality Standards for the beneficial uses of public water supply; industrial water supply; irrigation; livestock watering, anadromous fish passage; salmonid fish rearing and spawning; resident fish and aquatic life; wildlife and hunting; fishing; boating and rafting; water contact recreation; aesthetic quality; and cultural and religious practices.

WSFP/WSB submitted a report entitled "Deschutes River Water Evaluation" (prepared by H. Dettinger, March 15, 2000) as part of the permit application package. The purpose of this report was to determine the temperature rise of the river water at the point of discharging the cooling water back into the river. The report evaluated the increase in temperature in the Deschutes River according to the equation:

$$\text{Combined Temperature} = \frac{(\text{River Flow})*(\text{River Temp})}{\text{River Flow}} + \frac{(\text{Efflnt Flow})*(\text{Efflnt Temp})}{\text{Efflnt Flow}}$$

The report used a Deschutes River flow value of 3,450 cfs, a river temperature of 14.4º C (58º F), an effluent flow of 17.5 mgd (27.1 cfs) and an effluent temperature of 32.2º C (90º F). Based on these values, the projected increase in temperature for the Deschutes River is 0.18º C to a downstream temperature of 14.58º C. The report also provides a graph which shows projected temperature increases for Deschutes River flow rates of 3,000 to 6,500 cfs for various steam production rates. The permit application cites this report and states that the results indicate that there will be no measurable temperature increase in the River as a result of the changes requested in the application. However, the report does not use the low flow values recommended by EPA (e.g. 7Q10), which are lower than those used in these equations, and it does not consider the effects of the thermal plume, due to incomplete mixing of the discharge with the receiving water. These effects were evaluated by EPA using the CORMIX model, as described below.

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Section 432.100(4) of the Tribal Water Quality Standards allows for a mixing zone at the Tribe's discretion. The previous permit (1988) allowed a mixing zone of approximately one-third of the width of the river (100 feet) extending 400 feet downstream from the diffuser. The previous permit assumed that this mixing zone would represent one-third of the flow of the river. EPA has assumed that the Tribe will authorize a mixing zone with the same dimensions for the current reissuance of this permit. If the Tribe authorizes a larger or smaller mixing zone in its final Clean Water Act Section 401 certification of this permit, or does not authorize a mixing zone, the effluent limits in the final permit will be recalculated accordingly.

The Confederated Tribes of Warm Springs Reservation of Oregon WQS 432.025 states that no measurable surface water temperature increase resulting from anthropogenic activities is allowed unless a management plan has been reviewed and approved by the Tribe. This standard applies to the following:

(i) In a water body for which salmonid fish rearing (Table 4 CTWSRO WQS) is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C); or

(ii) In waters and periods of the year determined by the Tribe, (listed in Table 4 CTWSRO WQS, and Figure 1), to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a reach which exceeds 55.0°F(12.8°C); or

(iii) In waters determined by the Tribe to support or to be necessary to maintain the viability of native Oregon bull trout, (listed in Table 4 CTWSRO WQS, and Figure 1) when surface water temperatures exceed 50.0°F (10.0°C); or

(iv) In waters determined by the Tribe to be ecologically significant cold-water refugia (Table 4 CTWSRO WQS); or

(v) In stream segments containing federally listed Threatened and Endangered species.

The analysis of temperature supporting the original draft permit applied the "spawning" criterion of 12.8 ºC from October though March and the "rearing" criterion of 17.8 ºC from April through September. This is the spawning, incubation, and fry emergence period for fall Chinook. This was an incorrect interpretation of the water quality standards.

According to Figure 1 of the Water Quality Standards, Beneficial Uses, and Treatment Criteria of the Confederated Tribes of the Warm Springs

Indian Reservation of Oregon (WQS), the Deschutes River at the point of discharge supports spawning, incubation, and fry emergence for steelhead and rainbow trout in addition to fall Chinook spawning, incubation, and fry emergence. According to Figure 1 of the WQS, summer steelhead spawning begins on March 15th and fry emergence ends by July 15th. Rainbow trout spawning also begins on March 15th, and fry emergence ends by October 1st. Fall Chinook spawning begins on October 1st, and fry emergence ends by March 31st. Because the spawning, incubation, and fry emergence periods for rainbow trout and fall Chinook overlap, the "spawning, egg incubation, and fry emergence" criterion of 12.8 ºC applies year-round (not just from October though March as it was applied in the analysis supporting the original draft permit). This criterion is expressed as a 7-day average of the daily maximum temperatures (7DADM). This criterion has been deemed protective by the Tribe of the appropriate life stages of salmonids and has been approved by EPA.

In order to determine the compliance of the discharge with these water quality standards, EPA ran several modeling scenarios simulating mixing of the Warm Springs Biomass discharge in the Deschutes River. These scenarios, which were run with a CORMIX model, were also evaluated to determine the ability of the Warm Springs Biomass discharge to comply with the thermal plume provisions in the *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (EPA, 2003, referred to as the EPA Region 10 Temperature Guidance[1]), as well as the Tribal water quality standards (including mixing zone restrictions). The EPA Region 10 Temperature Guidance discusses the following impacts of thermal discharges on aquatic life:

1. Exposures of less than 10 seconds can cause instantaneous lethality at 32°C. Therefore, EPA used the model to determine if the maximum temperature within the plume, after 2 seconds of plume travel from the point of discharge, does not exceed 32°C and therefore will not cause instant lethality.
2. Thermal shock leading to increased predation can occur when salmon and trout exposed to near optimal temperatures (e.g., 15 °C) experience a sudden temperature increase to 26 – 30 °C for a short period of time. Therefore, EPA used the model to determine if more than 5 percent of the cross sectional area of the river would exceed 25 °C, to ensure that the discharge will not cause thermal shock to aquatic life leading to increased predation.
3. Adult migration blockage conditions can occur at 21°C. Therefore, EPA used the model to determine if more than 25 percent of the cross-sectional

[1] http://yosemite.epa.gov/r10/water.nsf/Water+Quality+Standards/TempGuidFinal

area of the river would exceed 21 ºC, to ensure that migration of adult salmonids will not be impeded by the discharge.

4. Adverse impacts on salmon and trout spawning, egg incubation, and fry emergence can occur when the temperatures exceed 13°C. However, this fact sheet does not discuss this temperature threshold because the numeric temperature criterion (12.8 ºC) is more stringent. The discharge is limited such that either this criterion is met at the edge of the mixing zone, or the discharge does not cause a measurable increase in the temperature of the river (i.e. 0.14 ºC).

The CORMIX Model

The Cornell Mixing Zone Expert System (CORMIX) version 5.0 was used to calculate dilution in this study. CORMIX is an 'expert system' that classifies discharges according to a complex system of length scale calculations using discharge and receiving water characteristics. Once classified, plume dilution and trajectory are calculated using the appropriate analytical solution, developed from extensive prior laboratory and field studies. The CORMIX mixing zone model was used for the following reasons:

- CORMIX is applicable to a wide variety of discharge and receiving water conditions and has been validated under a variety of actual field conditions; and
- CORMIX is supported by EPA and generally supported by State regulatory agencies and has been applied throughout the U.S. to evaluate existing and proposed discharges.

Scenarios considered

To evaluate the reasonable potential for the Warm Springs Biomass thermal discharge to violate the Tribe's water quality standards for the original draft permit, three scenarios were developed, as described in the fact sheet dated August 24, 2007.

EPA has since determined that only two of these scenarios are relevant. The modeling scenario that applied the Tribe's "rearing" temperature criterion of 17.8 ºC is irrelevant because the rearing temperature criterion never applies to the Deschutes River at the point of discharge.

Part 432.100(b) of the CTWSRO's standards define the Tribe's temperature criteria. Numeric criteria are expressed as seven-day averages of the daily maximum temperatures (7DADM). Waters designated for salmonid spawning and incubation have a 7DADM criterion of 12.8 ºC,

which applies during periods of time when spawning, incubation, and fry emergence are occurring. According to Figure 1 of the WQS, spawning, incubation, or fry emergence of either fall Chinook, steelhead, or rainbow trout occurs year-round. This means the spawning, incubation, and fry emergence criterion of 12.8 ºC applies year-round.

Review of two years of river temperature data collected at the intake for the turbine cooling water by Warm Springs Forest Products between January 1, 2005 and December 22, 2006 indicates that ambient river temperatures meet this criterion from November through May, but do not meet it from June through October.

In instances where river temperatures exceed the criterion, point source compliance is defined based on whether the point source causes a measurable increase, defined as 0.14ºC (0.25ºF), in the temperature of the receiving water (personal communication with Deepak Sehgal, Confederated Tribes of the Warm Springs Reservation of Oregon Tribal Environmental Office, 2007) at the edge of the authorized mixing zone. In all other cases, compliance with the temperature standards occurs if the discharge does not increase the river temperature above the applicable criterion at the edge of the authorized mixing zone.

The three scenarios evaluated in the revised reasonable potential analysis for temperature are explained in Table B-1, below:

Table B-1
Scenarios for Warm Springs Biomass Reasonable Potential Analysis for Temperature

Scenario	Model Flow (cfs)	7Q10 Flow	Upstream Temperature (°C)	Basis of Upstream Temperature	Criterion (°C)	Compliance with Criterion
June through October	3280	3230	12.8	Spawning, incubation and fry emergence criterion	12.8	<0.14 °C (0.25 °F) increase above background
November through April	3270	3220	11.2	95th percentile 7DADM temperature for the season of November though April	12.8	River temperature not greater than 12.8 °C
May	3270	3500	12.2	95th percentile 7DADM temperature for the month of May	12.8	River temperature not greater than 12.8 °C

Note that the upstream flow rates used in the model simulations are slightly different than the 7Q10 flows for the corresponding seasons. The June through October simulation flow rate is equal to the 7Q10 flow rate

for the month of October. The November through April and May flow rates are equal to the 7Q10 for the season of November through March. These seasons correspond to the model simulations used in support of the original draft permit. However, the actual 7Q10 flow rates for the seasons considered in this revised draft permit are either slightly greater than the simulated flow rates, or no more than 2% less than the flow rates used in the earlier model runs. Therefore, it is not necessary to repeat the model runs using the actual 7Q10 flow rates. The dilution factors predicted by the earlier model runs described in the fact sheet dated August 24, 2007 for various points downstream from the diffuser have been used to develop effluent limitations for this revised draft permit. The water quality criteria have been applied differently, however.

Two compliance points were evaluated for each scenario to comply with tribal mixing zone provisions: 400 feet downstream of the Warm Springs discharge and the distance where the plume extends to one-third (1/3) of the channel width.

Due to concerns about potential impacts to threatened and endangered species, compliance with the thermal plume provisions in the EPA Region 10 Temperature Guidance was also evaluated for each of the three scenarios in addition to evaluation of compliance with the tribal water quality standards and mixing zone provisions as described above.

The following provisions of the guidance were evaluated for each of the scenarios:

Table B-2
EPA Region 10 Temperature Guidance Considerations

Condition	^{o}C	Compliance Point
Instantaneous lethality	32	2 seconds of travel time from the point of discharge
Thermal shock	25	Downstream distance where plume encompasses 5% of channel cross-sectional area
Adult migration blockage	21	Downstream distance where plume encompasses 25% of channel cross-sectional area

Input assumptions

The CORMIX model requires inputs for effluent conditions (flow and temperature), discharge configuration, and ambient conditions (including channel characteristics, wind speed, flow, and temperature). CORMIX

inputs for the three temperature scenarios described in Table B-1 are presented in Table B-3 below. The model inputs were structured to match the idealized assumptions inherent to the CORMIX model.

Table B-3
Summary of CORMIX2 Model Inputs for Warm Springs Biomass Discharge

Effluent Information	
flow rate = 17.5 MGD	effluent temperature = 32 ºC (maximum effluent temperature)
Discharge Information	
nearest bank = left	contraction ratio = 1
diffuser length = 12.8 m	total # openings = 84
distance to one endpoint = 7.10 m	alignment angle = 135º
distance to other endpoint = 16.16 m	diffuser arrangement = unidirectional
port height = 0.45 m	vertical = 22.5 º
port diameter = 0.0762 m	horizontal = 45 º
	relative orientation = 90 º
Ambient Information	
water temperature = Deschutes River temperature corresponding to scenario (see Table B-1)	width = 58 m
average depth = 1.6 m	Manning's n = 0.03
discharge depth = 1.6 m	wind speed = 2 m/s
flow rate = Deschutes River 7Q10 flow corresponding to scenario (see Table B-1)	

Information about the diffuser (number of ports, angles, etc.) was obtained from a detailed diffuser drawing provided by the Tribe. Channel information (average depth, width, and Manning's n) was also provided by the Tribe.

Water temperatures for the November through April and May scenarios were calculated based on the 95th percentile 7DADM (7 day average of the daily maximum) temperatures for the Deschutes River. In the June through October scenario, the numeric water quality criterion of 12.8 ºC was used. Deschutes River 7Q10 flows were calculated with EPA's model DFLOW, version 3.1b using the available period of record for the United States Geological Survey stream gauge on the Deschutes at Madras, Oregon (Station 14092500).

Results

Results for the reasonable potential analysis for temperature indicate that the Warm Springs Biomass discharge has reasonable potential to cause or contribute to excursions above applicable water quality standards when discharging at 32^{o}C and 17.5 MGD from May through October. The discharge is not predicted to result in excursions above water quality

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standards and EPA temperature guidance from November through April (see Table B-4). Therefore, from November through April, the temperature limit will be 32 ºC, and the flow limit will be 17.5 mgd, as simulated by the model, and no limit will be placed on heat (in addition to temperature).

In May, the model predicts that the temperature at the edge of the mixing zone will be 0.4 ºC greater than the criterion of 12.8 ºC, under critical conditions (see Table B-4). Therefore, a more stringent temperature limit must be imposed on the discharge in May.

For the June through October scenario (refer to Table B-4), an increase of 1.01 ^{o}C is predicted at the mixing zone boundary of 400 feet. In addition, an increase of 0.47 ^{o}C is predicted at the point where the plume extends to 1/3 the channel width or 19.3 m (located at a downstream distance of 1985 m). Both of these predicted temperature increases are greater than the 0.14 ºC allowable increase, which applies when ambient temperatures are greater than the criterion. Therefore, additional restrictions must be imposed on the discharge from June through October.

Predicted dilution factors, river temperatures, and plume locations for each of the three initial (32 ºC effluent temperature) scenarios are shown in Table B-4, below

Table B-4
Reasonable Potential Model Results for Temperature
(Effluent Temperature = 32 ºC)

Plume Location	Criterion or Guidance Value (^{o}C)	Predicted Dilution Factor	Predicted Temperature (^{o}C)	Increase over Criterion or Threshold (^{o}C)	Distance Downstream (m)	Meets Criterion or Guidance Value?
June through October (Ambient temperature = 12.8 ^{o}C)						
Mixing zone length = 400 ft	12.8	19	13.8	**1.01**	122	**No**
Mixing zone width = 1/3 channel width	12.8	41	13.3	**0.47**	1985	**No**
Instantaneous Lethality (2 seconds travel time from discharge)	32	8.1	15.2	-16.8	2	**Yes**
Thermal shock (5% channel cross-sectional area)	25	6.3	15.8	-9.15	1	**Yes**

Table B-4 Reasonable Potential Model Results for Temperature (Effluent Temperature = 32 °C)						
Plume Location	**Criterion or Guidance Value (°C)**	**Predicted Dilution Factor**	**Predicted Temperature (°C)**	**Increase over Criterion or Threshold (°C)**	**Distance Downstream (m)**	**Meets Criterion or Guidance Value?**
Adult migration blockage (25% channel cross-sectional area)	21	31	13.4	-7.57	476	**Yes**
November through April (Ambient temperature = 11.2 °C)						
Mixing zone length = 400 ft	12.8	19	12.3	-0.51	122	**Yes**
Mixing zone width = 1/3 channel width	12.8	40	11.7	-1.08	1917	**Yes**
Instantaneous Lethality (2 seconds travel time from discharge)	32	8.1	13.8	-18.2	2	**Yes**
Thermal shock (5% channel cross-sectional area)	25	6.3	14.5	-10.5	1	**Yes**
Adult migration blockage (25% channel cross-sectional area)	21	30	11.9	-9.1	476	**Yes**
May (Ambient temperature = 12.2 °C)						
Mixing zone length = 400 ft	12.8	19	13.2	0.44	122	**No**
Mixing zone width = 1/3 channel width	12.8	40	12.7	-0.11	1917	**Yes**
Instantaneous Lethality (2 seconds travel time from discharge)	32	8.1	14.6	-17.4	2	**Yes**
Thermal shock (5% channel cross-sectional area)	25	6.3	15.3	-9.66	1	**Yes**
Adult migration blockage (25% channel cross-sectional area)	21	30	12.9	-8.15	476	**Yes**

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Predicted temperatures in the tables above were calculated from the following dilution equation:

$$T = T_{eff}/S + T_{amb}*[(S-1)/S]$$

Where T = edge of plume temperature, T_{amb} = ambient temperature, T_{eff} = effluent temperature, and S = model predicted dilution factor at a given point.

Calculation of Effluent Limits for May and for June though October

The 7Q10 flow rate of the Deschutes River varies only slightly with the season, and dilution factors predicted for each of the three scenarios considered in the reasonable potential analysis are almost identical. Therefore, the effluent temperature required to cause no measurable increase in water quality water temperature at 400 feet downstream from the discharge can be calculated based on the following equation.

$$T_{eff} = S \times T - (S-1) \times T_{amb}$$

Using this equation, given a dilution factor (S) at 400 feet of 19:1 (Table B-4), required edge of mixing zone temperature (T) of 12.94 ^{o}C (0.14 ^{o}C over the 12.8 ^{o}C "spawning" criterion), and an ambient temperature (T_{amb}) of 12.8 ^{o}C, the effluent temperature required for compliance with the tribe's water quality standards and EPA Region 10 Temperature Guidance for June through October was calculated to be 15.46 ^{o}C. However, during June through October, EPA has chosen to express the effluent limits in terms of temperature, flow rate, and a net rate of addition of heat, as described below.

During May, the effluent temperature required for compliance with WQS ant the Temperature Guidance was calculated to be 23.6 ºC, based on the dilution factor achieved at the edge of the mixing zone (19:1). Therefore, this is the proposed effluent limit for May.

Basis for Limit on Net Rate of Addition of Heat (June – October)

In instances where river temperatures exceed the criterion, point source compliance is defined based on whether the point source causes a measurable increase, defined as 0.14 ºC (0.25 ºF), in the temperature of the receiving water. Therefore, compliance is therefore not determined using a fixed receiving water temperature, rather, it is determined using a fixed interval above the ambient temperature.

Because compliance is determined using a fixed interval above the ambient temperature, it is possible to express the effluent limit using a limit on addition of heat to the river, as opposed to temperature. Water has a heat capacity that is essentially constant over the range of temperatures and pressures observed in the environment. Therefore, a given amount of heat discharged to the river, at a given river flow rate, will raise the temperature of the river by a fixed amount.

As a first approximation, the rate of addition of heat limit was calculated by determining the amount of energy that would be necessary to raise the temperature of the facility's intake water from an initial temperature of 12.8 ºC to an effluent temperature of 15.46 ºC, if the flow rate was 17.5 mgd, consistent with the calculation described above. This is calculated using the following equation:

$Q = mC_p\Delta T$

Where:

Q = Energy, as heat, imparted to the receiving water

m = Mass flow rate of the effluent
= 17,500,000 gallons/day × 8.34 lb_m/gallon = 145,950,000 lb/day

C_p = Specific heat capacity of water at constant pressure
= 1 BTU/(lb×ºF)

ΔT = Temperature change between intake and effluent
= 2.66 ºC × 1.8 ºF/ºC = 4.79 ºF

Q = 145,950,000 lb/day × 1 BTU/(lb × ºF) × 4.788 ºF
= 699,000,000 BTU/day.

To determine if an effluent limit of 699,000,000 BTU/day would be protective under all combinations of effluent flow rates and temperatures, EPA ran two additional CORMIX simulations. The "high effluent flow" scenario used an effluent temperature of 15.46 ºC and an effluent flow rate of 17.5 mgd, and the "low effluent flow" scenario used an effluent temperature of 32 ºC and an effluent flow of 3.22 mgd (which was the lowest effluent flow rate that could be used without the model becoming unstable).

The "high effluent flow" scenario showed that a discharge of 17.5 mgd of water at 15.46 ºC would be protective of water quality standards (i.e. it would cause only a 0.14 ºC increase above background) at the edge of the mixing zone. However, for the "low effluent flow" scenario, it would be necessary to reduce the effluent temperature to 26.73 ºC in order to comply with the 0.14 ºC allowable increase at the edge of the mixing zone.

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With the flow rate of 3.22 mgd, this corresponds to 673,000,000 BTU/day of heat, which is about 4% lower than the heat limit calculated from the "high effluent flow" scenario. The more restrictive heat limit of 673,000,000 BTU/day is proposed in the draft permit, and this limit will be protective of water quality for all allowable combinations of effluent flow rate and temperature. Results of the modeling scenarios are described in Table B-5, below.

Table B-5
Model Results for June through October Heat Rate Limit (673,000,000 BTU/day)

Plume Location	Criterion or Guidance Value (°C)	Predicted Dilution Factor	Predicted Temperature (°C)	Increase over Criterion or Threshold (°C)	Distance Downstream (m)	Meets Criterion or Guidance Value?
June through October High Effluent Flow (Effluent Temperature 15.46 °C, Effluent Flow 17.5 mgd, Ambient temperature = 12.8 °C)						
Mixing zone length = 400 ft	12.8	19	12.94	0.14	122	Yes
Mixing zone width = 1/3 channel width	12.8	41	12.89	0.09	1985	Yes
Instantaneous Lethality (2 seconds travel time from discharge)	32	0	15.46	-16.54	0	Yes
Thermal shock (5% channel cross-sectional area)	25	0	15.46	-9.54	0	Yes
Adult migration blockage (25% channel cross-sectional area)	21	0	15.46	-5.54	0	Yes
June through October Low Effluent Flow with Maximum Temperature (Effluent Temperature 32 °C, Effluent Flow 3.22 mgd, Ambient temperature = 12.8 °C)						
Mixing zone length = 400 ft	12.8	99.5	**12.99**	0.19	122	**No**
Mixing zone width = 1/3 channel width	12.8	162	12.92	0.12	1917	Yes
Instantaneous Lethality (2 seconds travel time from discharge)	32	38.4	13.3	-18.7	2	Yes
Thermal shock (5% channel cross-sectional area)	25	27.9	13.49	-11.51	1	Yes
Adult migration blockage (25% channel cross-sectional area)	21	162	12.92	-8.08	409	Yes
June through October Low Effluent Flow with Reduced Temperature (Effluent Temperature 26.73 °C, Effluent Flow 3.22 mgd, Ambient temperature = 12.8 °C)						
Mixing zone length = 400 ft	12.8	99.5	12.94	0.19	122	Yes

Table B-5 Model Results for June through October Heat Rate Limit (673,000,000 BTU/day)						
Plume Location	**Criterion or Guidance Value (°C)**	**Predicted Dilution Factor**	**Predicted Temperature (°C)**	**Increase over Criterion or Threshold (°C)**	**Distance Downstream (m)**	**Meets Criterion or Guidance Value?**
Mixing zone width = 1/3 channel width	12.8	162	12.89	0.09	409	Yes
Instantaneous Lethality (2 seconds travel time from discharge)	32	0	26.73	-5.27	0	Yes
Thermal shock (5% channel cross-sectional area)	25	27.9	13.3	-11.7	1	Yes
Adult migration blockage (25% channel cross-sectional area)	21	162	12.89	-8.11	476	Yes

Table B-6 Model Results for May Effluent Temperature Limit (23.6 °C)						
Plume Location	**Criterion or Guidance Value (°C)**	**Predicted Dilution Factor**	**Predicted Temperature (°C)**	**Increase over Criterion or Threshold (°C)**	**Distance Downstream (m)**	**Meets Criterion or Guidance Value?**
Mixing zone length = 400 ft	12.8	19	12.8	0.00	122	**Yes**
Mixing zone width = 1/3 channel width	12.8	40	12.5	-0.32	1917	**Yes**
Instantaneous Lethality (2 seconds travel time from discharge)	32	8.1	13.6	-18.4	2	**Yes**
Thermal shock (5% channel cross-sectional area)	25	6.3	14.0	-11.0	1	**Yes**
Adult migration blockage (25% channel cross-sectional area)	21	30	12.6	-8.4	476	**Yes**

In compliance with the anti-backsliding provisions of the Act and in order to prevent instantaneous lethality to salmonid fish, the 32 °C limit on the effluent temperature is retained during June through October. The net rate of addition of heat limit of 673,000,000 BTU/day is imposed in addition to the 32 °C temperature limit and the 17.5 mgd flow limit from June through

October. The permittee must comply with both the heat limit and the temperature limit. This means that the permittee may discharge effluent at a temperature of 32 ºC, if the effluent flow rate is sufficiently low such that the heat load limit is met.

Conclusions

Based on the preceding analysis, the Warm Springs Biomass discharge has the reasonable potential to cause or contribute to excursions above water quality standards for temperature, so effluent limits have been imposed for temperature and, from June through October, heat. For November through April, the effluent limits were set equal to the temperature and flow rate initially simulated in the CORMIX model, 32 ºC and 17.5 mgd. The previous (1988) permit had an effluent temperature limit of 32 ºC. The model predicted that the river would meet water quality standards at the edge of the Tribe's authorized mixing zone from November through April as long as the facility complies with those two effluent limits.

For May, the mixing model was applied to determine the maximum effluent temperature that would result in compliance with the water quality criteria at the edge of the mixing zone under critical conditions. This effluent temperature was calculated to be 23.6 ºC; therefore, that is the proposed effluent limit for the month of May.

For June through October, the mixing model was applied to determine the amount of heat that the discharge could add to the river without causing a measurable increase in the temperature of the river. The net rate of addition of heat limit of 673,000,000 BTU/day is an additional restriction on the discharge which applies during June through October. The 32 ºC temperature effluent limit from the previous permit has been retained for the June – October season, in addition to the effluent limits on temperature and flow.